REMARKS

Favorable reconsideration of this application is respectfully requested in view of the following remarks.

By way of this Amendment, the original claim terminology referring to "high" strength material has been deleted.

With respect to the wording in various dependent claims reciting that the through holes viewed in the circumferential direction are arranged axially offset, this language describes the subject matter discussed in paragraph [0024] of the present application, namely that the through holes are arranged along lines 9 (shown in Fig. 1) that are axially offset relative to the axis of the plain bearing bush. Thus, as an alternative to the "circumferentially offset" language suggested in the Official Action, Claims 5 and 14 have been amended to recite that the through holes are arranged along lines which cross axial ends of the plain bearing bush and are not parallel to the central axis.

In light of the foregoing amendments, withdrawal of the claim rejections based on 35 U.S.C. § 112, first and/or second paragraphs, are respectfully requested.

Appreciation is expressed to Examiner Footland for the indication that Claims 3, 11, 12 and 15 would be allowable if rewritten in independent form. Claim 1 has been amended to include the subject matter recited in Claim 3, and Claim 3 has been canceled. It is thus respectfully submitted that independent Claim 1 and dependent Claims 2 and 4-8 are allowable.

New independent Claim 16 and new dependent Claims 17-21 are presented in this Amendment. Thus, in light of the allowability of Claims 1, 2 and 4-8, the only

claims currently at issue are Claims 9-21, with Claims 9 and 16 being the only independent claims.

The Official Action sets forth a rejection of independent Claim 9 based on the disclosure contained in U.S. Patent No. 1,996,841 to *Stevens*. That rejection is respectfully traversed for at least the following reasons.

Independent Claim 9 defines a plain bearing bush in the form of a hollow cylinder possessing a longitudinal axis and comprising first and second hollow cylindrical parts. The first and second hollow cylindrical parts are coaxial with respect to the longitudinal axis of the hollow cylinder, with the first hollow cylindrical part surrounding the second hollow cylindrical part. The first and second hollow cylindrical parts are made of different materials and are each provided with a plurality of through holes, with the through holes in the first hollow cylindrical part being aligned with the through holes in the second hollow cylindrical part to form through holes in the hollow cylinder each having a hole axis that is perpendicular to the longitudinal axis of the hollow cylinder.

One of the differences between the subject matter at issue here and the disclosure contained in *Stevens* is that the subject matter at issue here pertains to a plain bearing bush in the form of a hollow cylinder provided with a plurality of through holes, with the holes being arranged along lines that intersect axial ends of the plain bearing bush. That is, unlike the separator disclosed in *Stevens* which includes a single row of openings that receive rolling elements, the plain bearing here includes through openings that are adapted to serve as storage regions for lubricant or the like. Independent Claim 9 has been amended to recite that at least two of the through holes in the hollow cylinder are arranged along a line that intersects axial

ends of the plain bearing bush. Quite clearly, this is not the case with the through holes 4 disclosed in *Stevens*. Moreover, as noted above, the openings 4 in the separator disclosed in *Stevens* are specifically intended to receive respective rolling elements 5. Thus, there would have been no reason to modify the configuration of the separator disclosed in *Stevens* to include an arrangement of openings as recited in independent Claim 9. It is thus respectfully submitted that independent Claim 9 is allowable.

New independent Claim 16 has been added to highlight another readily apparent distinction between the invention at issue and the disclosure in *Stevens*. The invention at issue here pertains to a plain bearing bush. *Stevens* does not disclose a plain bearing bush, but rather discloses a separator which receives rolling elements for a rolling element bearing. As is known in the art, and as the Examiner is likely aware, plain bearings do not utilize rolling elements to provide rolling contact between mating parts. Rather, plain bearings are devoid of rolling elements so that sliding contact exists between the mating parts. Attached for the Examiner's reference is a printout of information obtained from the internet describing the differences between plain bearings and rolling element bearings.

Because the invention at issue here pertains to a plain bearing bush, the through holes provided in the plain bearing bush do not receive rolling elements, but instead are adapted to serve as a storage region for lubricant or the like as described in the present application. This is to be contrasted with the separator disclosed in *Stevens* in which the openings 4 are specifically provided for receiving rolling elements 5. It is thus apparent that *Stevens* does not disclose a plain bearing bush as originally claimed. Nevertheless, to better set forth this distinction in the body of

the claim, new independent Claim 16 recites that none of the through holes receives a rolling element.

It is thus respectfully submitted that new independent Claim 16, together with dependent Claims 17-21, are also allowable.

Early and favorable action with respect to this application is respectfully requested.

Should any questions arise in connection with this application or should the Examiner believe that a telephone conference with the undersigned would be helpful in resolving any remaining issues pertaining to this application the undersigned respectfully requests that he be contacted at the number indicated below.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

Date: July 26, 2005

By: Matthew L. Schneider
Matthew L. Schneider
Registration No. 32,814

P.O. Box 1404
Alexandria, Virginia 22313-1404
(703) 836-6620

GET YOUR BEARINGS

Why Use Bearings?
The purpose of this article is to provide a basic understanding of the different types of bearings available as well as their typical applications and where you might find them. Ther can sometimes be a choice of bearings that would suit one application, but generally the customer or application will dictate the style that is best. The next in this series of Torque T articles will give detailed insight into the sizing and selection of bearings for specific applications.

Different Types of Bearings
The most common types of bearings are rolling element bearings or sleeve type/plain bearings. Some unusual types of bearings consist of air bearings or magnetic bearings.

Typical Bearing Applications

Bearings perform so many functions in our daily lives we overlc many of their common purposes. Bearings are used to transmi motion and load from component to component. This motion is most frequently a rotation but can be a linear or sliding moverr as well.

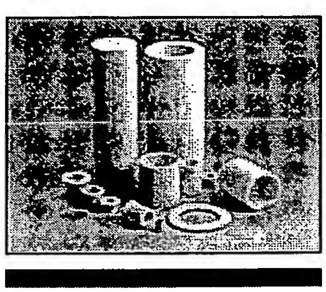
The single stage speed reducer will typically have 3-4 bearings and the double stage reducer 6 bearings. The bearings are usu tapered roller bearings or ball bearings depending upon the loading arrangement.

Hundreds of bearings are used in manufacturing every car. They are used in the wheel bearings, main engine bearings, transmission bearings, door hinges, steering linkage, sway bars, sliding seats and rotating headlight. Without good bearing products our lives would be much different then they are today.

Truck/automotive transmissions can have a variety of cylindrical roller bearings, needle roll bearings, sleeve bearings, and tapered roller bearings. The bearing chosen will largely be dictated by the load/speed spectrum as well as physical space/design requirements.

Now we will explain some differences between the rolling element and plain bearings.

Sleeve Bearings



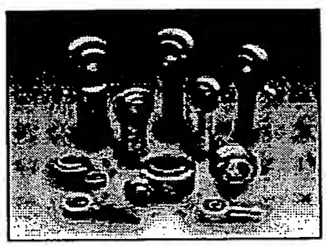
Sleeve bearings have no rolling elements so each surface slide relative to one another. This sliding action creates more heat t rolling element bearings thus RPM is often a limiting factor. Th applications that generally use these bearings have a slow speed/motion spectrum with moderate loads. The loads are generally limited to hundreds of pounds depending upon size v speeds generally less than 500 RPM. The critical information necessary for selecting a sleeve bearing is the load and velocit the mating components. Life of sleeve bearings is dictated larg

by the environment and maintenance care. Due to the sliding action between the two surfa these bearings tend to wear over time. Some plain bearings are pressurized with lubricatioı separating the two surfaces during operation.

Boston Gear offers the following list of materials in different configurations such as bushing bushings with flanges and washers. Lengths of solid bars and cored bars are also available.

- Sintered Bronze SAE 660 bronze
- Glass filled Teflon® Rulon® 641
- Molded plastic molded nylon
- Cast iron rod ends male and female
- Washdown duty pillow blocks and flanges

Rolling Element Bearings

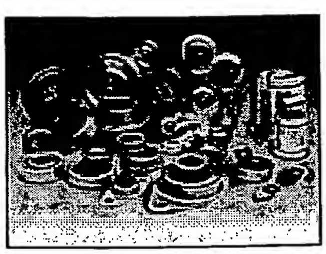


Bearings with rolling elements are often called antifriction bearings because they have lower friction, generate less heat, mechanical losses are lower. These bearings could have balls o some type of roller as the rolling element. The rolling elements are ground to precise tolerances and need to be protected (sealed), lubricated adequately and handled carefully. These bearings require a small gap between the rolling element and t raceways. This gap is the bearing clearance and is necessary fc thermal expansion of the metal components. Rolling element bearings do not wear like plain bearings and therefore the bearing clearance stays constant throughout the life of the bearing.

These bearings can be designed to carry radial loads, thrust loads, and combinations of bot Selecting the right bearing for the load/application is critical for bearing performance. For a sealed and greased bearing the critical selection criteria revolves around the applied load, ε the RPM. With this information bearing life can be reliably predicted.

- Major types of rolling element bearings
- Ball bearings tapered roller bearings
- Spherical roller bearings cylindrical bearings
- Needle bearings

Ball Bearings



Ball bearings can run at very high speeds but generally cannot carry very high loads. They must be well aligned or allowed to align within a spherical housing. The spherical housing is typicε for mounted type ball bearings (i.e. pillow blocks, flanges...). Standard deep groove ball bearings do not carry heavy thrust loads but angular contact ball bearings can carry moderate thrı loads. The raceways are generally honed to provide smooth qu operation in many household appliances such as electric motor fans, and pumps. These bearings can be supplied with or witho grease and seals. The clearance in this bearing is controlled by the combination of balls anc raceway diameters.

Boston Gear offers the following ball bearings in many different configurations.

- 1600, 7500, 400F & 3000 series single row ball bearings sealed and unsealed
- 7600 series extended inner race single row ball bearings, set screw mounted
- 6900 series flanged mounted single row ball bearings, set screw mounted
- AO, SAO, 600 series thrust ball bearings banded and unbanded
- 2000, 2100, 2000 series sheaves and wheels ball bearing mounted
- Mounted ball bearings in pillow blocks, flanges, piloted flanges in cast iron, cast steel
- Pressed steel options with set screws or eccentric locking collars

Tapered Roller Bearings

These are the workhorse bearings for many industrial applications. The roller in this bearinç tapered similar to a cone with the point cut off. This bearing must be well aligned due to th rigid length of the roller. Excessive misalignment will cause edge loading of the roller and quick failures. This bearing does not run at very high speeds but is designed for high load applications. It will carry both heavy radial and combination thrust loads. Common applications are automotive wheel bearings, speed reducers and industrial equipment. This bearing is generally supplied as a non sealed separable two piece bearing. The bearing clearance must be adjusted during the assembly process.

Spherical Roller Bearings

Spherical roller bearings have rollers that are typically shaped like an old wooden barrel. These bearings are also a workhorse for many industrial applications. This bearing is desigr to accept misalignment from heavy loads or mounting inaccuracy unlike the tapered roller bearing. Spherical bearings will run at moderate speeds with heavy radial and combination loads. The most common applications are large paper mills, steel processing plants, and industrial equipment. This bearing is commonly found sealed and lubricated in mounted bearing products (pillow blocks, flange blocks...) but the unsealed version is also common ir industrial applications like the tapered roller bearing. The naked bearing has the bearing clearance built into the raceway size.

Cylindrical/Needle Roller Bearings

The rollers in these bearings are shaped like a cylinder. The needle bearing has a roller thai much smaller and longer than a cylindrical bearing. The cylindrical bearing can run at high speeds and high loads but can not handle significant thrust loads like the tapered roller bearing. Cylindrical bearings are most commonly found unsealed and are used in industrial applications. The clearance is built into this bearing by controlling the size of the rollers anc the raceways.

In future commentary we will explain the proper handling and care of bearings as well as h to select the proper bearing for specific applications.

Please send questions or comments about this article to engineering@bostongear.com.